

TRANSMITTAL

To: Winoma Johnson
 Naval Facilities Engineering Command,
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From: CH2M HILL

Attn: Winoma Johnson

Date: November 10, 2006

Re: Final Ecological Risk Assessment – Step 7, Upper Reaches of Bousch Creek, Camp Allen Landfill (Site 1), Naval Station Norfolk

We Are Sending You:

<input checked="" type="checkbox"/> Attached	Under separate cover via		
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Quantity	Description
2	Final Ecological Risk Assessment – Step 7, Upper Reaches of Bousch Creek, Camp Allen Landfill (Site 1), Naval Station Norfolk
1	Electronic Copy (Native and PDF versions) of Final Ecological Risk Assessment – Step 7, Upper Reaches of Bousch Creek, Camp Allen Landfill (Site 1), Naval Station Norfolk

If material received is not as listed, please notify us at once

Remarks:

Enclosed are two hardcopies of the Final Ecological Risk Assessment – Step 7, Upper Reaches of Bousch Creek, Camp Allen Landfill (Site 1), Naval Station Norfolk and one electronic copy (on CD). If you have any questions, please do not hesitate to contact me at 703-471-6405 ext 4346.

Sincerely,

Holly Rosnick

Copy To:

Josh Barber/USEPA (3 hardcopies and 1 electronic copy)
 Bruce Pluta/BTAG (electronic copy)
 Garwin Eng/VDEQ (2 hardcopies and 1 electronic copy)
 Paul Landin/CH2M HILL (1 hardcopy and electronic copy)
 Bonnie Capito/NAVFAC (1 hardcopy and 1 electronic copy)

**Response to Comments
Draft Ecological Risk Assessment – Step 7
Upper Reaches of Bousch Creek
Naval Station Norfolk, Norfolk, Virginia
Dated September 2005**

This document responds to comments from the U.S. Environmental Protection Agency (letter dated 14 April 2006) and the Virginia Department of Environmental Quality (letter dated 27 February 2006) on the draft Step 7 ecological risk assessment for the upper reaches of Bousch Creek, Naval Station Norfolk, Norfolk, Virginia (September 2005).

U.S. Environmental Protection Agency Comments

1. Section 1.2 on page 1-3 states that as discussed at the March 2002 and April 2004 Tier I partnering meeting, the scope of the ERA was limited spatially, in terms of quantitative risk evaluation to the upgradient end of the 3,900 foot culvert connecting Bousch Creek to Willoughby Bay. In Section 3.4.1, Potential Source Areas, the first bullet states, "The downstream spatial extent of the Bousch Creek ERA, in terms of quantitative risk evaluation, was the upgradient end of the 3,900-foot culvert connecting Bousch Creek to Willoughby Bay." While this limitation may be adequate for this limited ERA, it does leave open the question of whether, or not, contamination from Bousch Creek and the Navy has entered Willoughby Bay and whether, or not, this contamination is sufficient to cause ecological risk. Justification needs to be provided stating why downgradient areas will not quantitatively be evaluated, particularly when the migration pathway to Willoughby Bay is complete, and no ERA samples have been collected from the bay.

The Navy agrees that the spatial limits used are adequate for this ERA. The spatial focus of the ERA was discussed, and consensus achieved, during a 28 February 2002 Eco Subgroup call (as documented in the presentation developed by the Eco Subgroup that was presented to the partnering team at the March 2002 partnering meeting) and at the March 2002 and April 2004 partnering meetings (see the final meeting minutes). The Navy believes that the available data, as summarized and evaluated in the ERA, support the spatial focus of the assessment on the upper portions of the Bousch Creek system (i.e., upgradient of the 3,900-foot culvert) given the objective of the document (to evaluate potential impacts to the creek as related to the Camp Allen Landfill [CAL]). The focus on the CAL is a direct result of the genesis of the Bousch Creek ecological evaluation, which began following the Remedial Investigation/Feasibility Study (RI/FS) for the CAL. The RI/FS process resulted in the implementation of remedial actions at CAL (i.e., covering the landfill and installing a groundwater capture and treatment system) but deferred a more detailed evaluation of Bousch Creek to a future ecological evaluation. This future ecological evaluation began in 1997. It should be noted that samples collected from Bousch Creek in 1997, and again in 1999 and 2004, provided the bulk of the data used quantitatively in the current ERA document and that all three sampling programs were jointly scoped with the Region 3 BTAG.

This ERA focuses on the upper and upper-middle reaches of Bousch Creek, encompassing the areas upgradient of the 3,900-foot culvert. This spatial focus (relative to CAL) is justified by the analysis in Section 6.7.3.2 (spatial trends), which showed that for metals, pesticides,

and PCBs (which are known to be associated with the CAL and/or the Camp Allen Salvage Yard [CASY]), the highest concentrations tend to be associated with historical samples from CASY and the northern portion of CAL (Zones 1, 2, 4, and 5), while the lowest concentrations tend to be associated with the upper-middle reaches of the Bousch Creek system nearest the culvert (Zones 7 and 8). For PAHs, which have numerous potential sources (including non-IR-related sources), the highest concentrations were typically associated with the CD Landfill (pre-remedial samples) and the area near I-564 and the runway (Zone 8).

An evaluation of the lower reaches of Bousch Creek (encompassing the culvert area) will be conducted as a separate, future assessment to address potential releases from IR sites (other than CAL/CASY) that may have occurred in this portion of the Bousch Creek system.

2. Table 3-6, Fish Species Observed During Fall 2004 Studies, lists five species of fish, as well as grass shrimp, blue crab, and a snail, that were caught either in a minnow trap, gill net, or seine. Priest et.al. (2000) [Priest, Walter I., C. S. Hardaway, Jr. and D.A. Milligan. 2000. Bousch Creek: Marsh Restoration Plan, Norfolk Naval Base, prepared for Department of Conservation and Recreation and the Department of the Navy] identifies other aquatic species found in Bousch Creek. These additional species include inland silverside (*Menidia beryllina*), bay anchovy (*Anchoa mitchilli*), manhaden (*Brevoortia tyrannus*), striped bass (*Morone saxatilis*), gizzard shad (*Dorosoma cepedianum*), and snapping turtle (*Chelydra serpentina*). This information should be considered in the ERA.

The referenced information will be added to the final ERA document. However, it will not impact the conclusions of the assessment.

3. Table 3-12 and 6-21. Although amphibians are listed as being an assessment endpoint in Table 3-12 and listed as being evaluated qualitatively on the Conceptual Site Model (Figure 3-6), in Table 6-21 and Section 6.0, there are no conclusions or results presented in the report regarding amphibians or reptiles and how the measurement endpoints should be interpreted. Also, on Table 3-12, the receptors for the assessment endpoint of "survival, growth, and reproduction of amphibian populations" should be benthic invertebrates, fish, or birds and mammals. Listing "Amphibians" as the receptor species may indicate that amphibian tissue samples were collected or amphibian toxicity tests were performed.

Additional text will be added to the conclusion section of the final ERA document to specifically discuss the risk conclusions relating to amphibians and reptiles. The requested change will also be made to Table 3-12.

4. Section 5.3 on page 5-2 states that for food chain modeling, ingestion screening values based on survival, growth and reproduction were used to evaluate risk to upper trophic level receptors. Table 5-4 provides ingestion screening values for mammals. The no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) used to evaluate risk from polychlorinated biphenyls (PCB) are primarily 0.14 mg/kg/day and 0.69 mg/kg/day, respectively, for different Arochlors. BTAG has identified information on the effect of PCBs on mink with a value that is much lower than the values listed in Table 5-4. Two multi-generational studies have developed NOAELs and LOAELs based on mink reproduction and kit survival (0.003 and 0.19 mg PCB/kg bw/day) and kit growth (0.003 and 0.051 mg PCB/kg bw/day) from work in Saginaw Bay, Michigan. The first study (0.003 and 0.19) is from Heaton et. al. 1995.

Arch. Environ. Contam. Toxicol. 28:334-343; the second study (0.003 and 0.051) is from Restum et al. 1998. J. Toxicol. Environ. Health Part A, 54: 343-375. The results of these studies should be used to evaluate risk to mammals from PCBs.

The referenced studies were reviewed for possible inclusion in the assessment for the appropriate receptors (mink). Based upon this review, there are significant uncertainties associated with these two studies that would limit their applicability to this assessment. In both of these studies, mink were fed field-caught carp (treatment) that comprised various percentages of the total diet. However, in addition to PCBs, these fish contained a number of other contaminants, including dioxins, furans, and pesticides. The presence of these other contaminants increases the uncertainty of the resulting NOAEL/LOAEL values developed for PCBs since the possible effects of these other contaminants were not controlled for. This is acknowledged in the Restum et al. study which stated that "although environmental contaminants other than PCBs were also present in the carp fed to the mink in this study, the extent of the toxic contribution of these contaminants is difficult to assess. There is little or no information available on the effects of many of these contaminants on mink". For this reason, the Navy disagrees that these studies should be used to evaluate potential risks to mammals from exposure to PCBs via food webs. Controlled laboratory studies with mink and PCBs have typically yielded NOAEL and LOAEL values similar to the ones used in the assessment (differences can generally be attributed to factors such as varying assumptions in converting dietary concentrations to daily doses and the uncertainty factors that were applied).

It should be noted that modifying the current LOAEL value (0.69 mg/kg/day) to the lower values of either 0.19 mg/kg/day (a factor of about 3 lower) or 0.051 mg/kg/day (a factor of about 13.5 lower) would not result in any of the Step 7 LOAEL-based HQs exceeding one (see Tables 6-11 and 6-12).

5. Table 5-1, Uncertainty Factors Used in Food Web Models, presents uncertainty factors ascribed to various conversions from Wentzel et al. (1996). The process described in this source document, however, also addresses differences between species, genus, family/order, threatened/endangered in order to generate a toxicity reference value. It is not clear if the uncertainty factors shown in this table and referred to on page 5-2, Section 5.3, Ingestion Screening Values, are correctly applied without the other uncertainty factors relating to species, genus, family/order, and threatened/endangered status. This needs to be clarified.

There are no threatened or endangered species known to occur in the Bousch Creek system so the application of additional uncertainty factors for this class of receptors is not applicable to the ERA. In terms of the taxonomic class-type uncertainty factors, they were not applied because the values in Table 5-1 are typically derived based upon data from a broad range of taxonomic groups. The text of Section 5.3 will be modified to indicate this.

6. Section 6.1.2.2, Upper Reaches - Surface Sediment, states, "Although the mean HQs for alpha-chlordane, gamma-chlordane, and pyrene did not exceed one, these three chemicals were also identified as COPCs based upon the frequency of exceedance and/or the magnitude of the maximum HQ." There appear to be more than these 3 chemicals that meet one or both of these criteria. This issue, both in Sections 6.1.2.2 and 6.1.2.4, needs to be reviewed and addressed as necessary.

Both of these criteria were considered together when making these determinations; the text will be modified to indicate this. Sections 6.1.2.2 and 6.1.2.4 (including Tables 6-4 and 6-6) were reviewed to determine if additional chemicals warranted inclusion as COPCs. Based upon this review, it was determined that this is not the case.

7. Section 6.2, Comparison With Fish Tissue Screening Values, indicates "...whole-body fish tissue samples were collected." However, neither this section nor Table 6-7 identifies which fish species were collected. This information is needed to ensure that all fish are being included in this tissue comparison methodology. Also, additional information is needed to ensure that the screening values used in Tables 6-7 through 6-9 are appropriate.

All of the fish tissue samples collected from the Bousch Creek system were composed of mummichogs. This will be added to the text of the final ERA document. Table 5-3 provides the relevant information on the fish tissue screening values used in Tables 6-7 through 6-9.

8. Section 6.4, Toxicity Testing, refers to Table 6-14, Summary of Significant Differences From Toxicity Tests. A more clear explanation of the derivation of data presented in this table is needed. For example: 1) It is not clear why reference sample 20 is singled out / highlighted in the comparisons; 2) The information presented in Appendix B indicates that survival in reference samples 18, 19, and 20 averaged 51, 90, and 95, respectively. This suggests that survival of *Leptocheirus plumulosus* at reference sample 18 is different than the other two reference samples. The text needs to adequately explain why all three reference samples are being used. 3) It is not clear if the growth and reproduction measurement endpoints for the reference samples are significantly different from one another.

This table is a visual depiction of the data in Table 6-13. Reference sample 20 is not singled out in this table; it simply had more differences (and often was the only reference sample that was different) than the other two reference samples. Although reference sample 18 had lower survival than the other two reference samples, all three reference samples (and the control) were included in the comparison for completeness. As indicated in Table 6-13, the reference samples were not statistically compared to one another since these comparisons are of limited use in the context of the analysis.

9. Section 6.4, Toxicity Testing and Table 6-15. Using unionized ammonia concentrations (can be calculated using pH) may serve as a better indicator of ammonia as a potential confounding factor.

These conversions will be considered for inclusion in Table 6-15. However, it is unlikely that this would result in any changes to the conclusions of the analysis, particularly since the concentration of specific forms of ammonia is of lesser importance relative to correlations with effects.

10. Section 6.7.1, Upper Reaches, indicates that concentrations of two metals without screening values were "...relatively uniform across the upper reaches, as indicated by a coefficient of variation less than one, suggesting that these metals are present at background concentrations...." It is not clear if this methodology is correctly used to conclude that background concentrations are present.

The analysis suggests that these two metals are not elevated above naturally occurring levels since they do not show the relatively clear spatial trends in concentrations with distance from the CAL and CASY that many of the other metals do. The text will be modified to indicate this.

11. Table 6-21 presents a summary of the various lines of evidence collected to address the assessment endpoints and the two specific areas of Bousch Creek. Although all the necessary data is presented, the format is not very user-friendly and does not link the data results (or lines of evidence) back to the assessment and measurement endpoints as described in Table 3-12. Please expand upon this table so there is a clear link between the stated assessment endpoints and lines of evidence.

Table 6-21 will be modified to link the results of each column back to the applicable assessment and measurement endpoints.

12. Regarding Section 6.7.3, Spatial and Temporal Trends, there are a number of concerns. It is uncertain if data spanning a 14 year period (1991-2004) can reasonably be pooled into one spatial trend data set without adequate justification. Figures 6-9 and 6-10 suggest that different data sets can show differences between the same stream sections. This suggests it may be more appropriate to look at the data on a yearly basis and not a pooled basis to see spatial trends over time. It is not evident why the second pool of spatial trend data only involved data from years 1997, 1999, and 2004.

The available sample sizes are insufficient to conduct the spatial comparison on a yearly basis. In general, the trends in Figures 6-9 and 6-10 look different from each other largely because Zones 1 (CASY) and 7A (CD Landfill), where many of the highest sediment concentrations were found, are not included in Figure 6-10 because data were not collected within these zones in 1997, 1999, and 2004 due to the remedial actions that have or will occur in these areas. The second analysis limiting the data to 1997, 1999, and 2004 was an attempt to reduce the temporal variation of the spatial analysis and limit the data set to those data that were used quantitatively in the ERA for screening value comparisons and food web modeling. This explanation will be added to the text of the final ERA document.

13. In general, the uncertainty section needs to reasonably and adequately address the identified uncertainties and provide an indication of the potential impact on the ERA.

The uncertainty section will be modified to more completely discuss the potential impact of each uncertainty on the conclusions of the assessment.

14. Further information is needed to support the validity of the approach taken to evaluate the uncertainty associated with the reporting limits exceeding screening values. Ultimately, the ratio of the reporting limit to the screening value is comparable to the derivation of the HQ. The magnitude of the exceedance of the screening value is not necessarily directly correlated with the magnitude of risk. The important issue is whether or not the value is exceeded. Further interpretation introduces further, albeit different, uncertainties.

Because these chemicals were not actually detected on the site (using agreed-to sampling methods and analytical procedures), a ratio exceeding one is more of an uncertainty than an indication of potential risk since it is uncertain that the chemical is even present on the site, much less present at concentrations that would indicate potential risk. The potential risks/

uncertainties associated with these chemicals were deemed acceptable if standard methods and reporting limits were used, as discussed in Section 7 (uncertainties).

15. The discussion of receptor species selection in Section 7 appears to dismiss risk to amphibians because they "...are not expected to be major components of biotic communities in most portions of the Bousch Creek system due to salinity factors." This does not take the presence of amphibians in Bousch Creek into account. The ERA would greatly benefit from incorporation and discussion of the Navy's "Amphibian Ecological Risk Assessment Decision Matrix" (NAVFAC, 2004). Discussion of this matrix in the ERA would better evaluate potential risks to amphibians. Qualitative efforts such as field chorus surveys or egg mass counts would provide an indication of whether there is potential for the habitat to support amphibian populations (amphibians were identified in 1994 RI, but not during habitat surveys of 1999 or 2004). If the habitat is not capable of supporting amphibian populations, then no further work would be necessary. If suitable habitat is present, then more semi-quantitative and quantitative approaches are outlined in the matrix.

The methods and approaches to the ERA were outlined in the final Step 4 ERA work plan. During the development of the work plan, methods relating to amphibians were not deemed critical relative to other endpoints. Although portions of the Bousch Creek system have the potential to support some amphibian species (generally the mostly freshwater portions of the extreme upper reaches and at the CASY), amphibians are not expected to be major parts of biotic communities in the more saline portions of the system. The areas with the highest chemical concentrations are generally limited to the more saline portions of the system, except for the CASY where remedial actions have been completed.

16. When the spatial distribution of the sample locations is considered in conjunction with the receptor species and habitats present, it is not evident that uncertainty associated with the frequency of detection screening criterion has been appropriately described. This is particularly true if the sample locations being considered were selected to establish the presence and extent of contamination, rather than characterize the concentrations within a known area of contamination.

As discussed in the uncertainty section, frequency of detection played a very minimal role in the analysis and it was thus not an important consideration in the overall conclusions of the ERA. Very few chemicals were screened out based solely upon this criterion. Those few that were screened out solely on this basis were chemicals lacking chemical-specific or surrogate screening values.

17. Section 8.1, Conclusions, states, "The Bousch Creek system...currently provides limited habitat values for most ecological receptors." The issue that the risk assessment must ultimately evaluate is not whether habitat values are limited, but rather what is the ecological risk associated with the contaminants that are present. Reduced habitat value can be directly related to the impact of the contaminants, and the recovery of the system may be contingent on the mitigation of the identified risk.

As discussed in the ERA, the Bousch Creek system has been significantly impacted due to channelization and other physical modifications. Thus, large portions of the creek system, as currently configured, provide limited habitat values irrespective of chemical concentrations. As this will limit exposures, it is relevant both to the determination of overall risk and to

decision-making as part of risk management. While there may be viable habitat in certain areas of the upper portion of Bousch Creek, the spatial extent is limited, especially relative to ecological populations.

18. Table 3-6, Fish Species Observed During Fall 2004 Studies, lists five species of fish, as well as grass shrimp, blue crab, and a snail, that were caught either in a minnow trap, gill net, or seine. Priest et.al. (2000) [Priest, Walter I., C. S. Hardaway, Jr. and D.A. Milligan. 2000. Bousch Creek: Marsh Restoration Plan, Norfolk Naval Base, prepared for Department of Conservation and Recreation and the Department of the Navy] identifies other aquatic species found in Bousch Creek. These additional species include inland silverside (*Menidia beryllina*), bay anchovy (*Anchoa mitchilli*), manhaden (*Brevoortia tyrannus*), striped bass (*Morone saxatilis*), gizzard shad (*Dorosoma cepedianum*), and snapping turtle (*Chelydra serpentina*). This information should be considered in the ERA.

Please see the response to USEPA Comment 2.

Virginia Department of Environmental Quality Comments

1. 2.2.1.4, paragraph 2, last sentence, page 2-4 – The CAPs addressing contaminated groundwater in the LP area are mentioned here and elsewhere in the *Draft Step 7 ERA*. Please include the Site 20 AS/SVE systems that are also addressing contaminated groundwater in this area.

This information will be added to the final ERA document.

2. 5.4, paragraph 2, 1st bullet, 7th sentence, page 5-3 – Please revise this sentence to read “If no significant difference existed....”

The requested change will be made in the final ERA document.

3. Section 6, Initial Creek-Wide Evaluation – Initial comparisons were conducted for media, fish tissue, and food web exposures on a creek-wide basis. The Department is concerned that such creek-wide comparisons have the effect of “diluting” maximum detects and means and could, therefore, change the list of constituents that would carry through if only area-specific evaluations were conducted. Please provide detailed discussions in Sections 7 and 8 on the use of the creek-wide comparison and its possible effects on the results.

Since the creek-wide comparisons are based upon the maximum concentrations, they represent a “worst-case” evaluation. If a chemical in a particular medium does not exceed a screening value or other criterion based upon the maximum concentration within the entire system, it cannot exceed in any kind of area-specific evaluation. Since possible “dilution” effects could occur using means, the means were only used in the area-specific evaluations where the spatial area was more restricted.

4. 6.1.2.2, paragraph 1, last sentence, page 6-2 – This states that, based upon the frequencies of detection and/or the magnitudes of the maximum HQs, certain constituents were identified as COPCs even though their mean HQs did not exceed one. Please specify the criteria for the frequency of detection and/or the magnitude of the maximum HQ of such constituents.

Please see the response to USEPA Comment 6. There were no defined criterion that were uniformly applied. The decisions were based upon professional judgment taking into account the magnitude of the mean HQ (i.e., if very close to one), the magnitude of the maximum HQ (to account for possible "hot-spots"), and the frequency of detection simultaneously. This will be added to the text of this section.

5. 6.1.2.4, paragraph 1, last sentence, page 6-3 – See comment 4 above.

Please see the response to VDEQ Comment 4.

6. 6.2.2, pages 6-3 through 6-4 – The mean concentrations did not exceed but approached NOEC-based screening values. Therefore, based upon the frequencies of detection and maximum concentrations, it seems that copper should have been selected as a COPC in the area-specific evaluations. (Also see comment 4 above.)

Copper was not retained due to the low magnitude of the maximum NOEC-based HQ and the lack of LOEC-based exceedances.

7. Section 8 – Per section 1.1, the results of the Step 7 ERA should include the magnitude of the potential risk. Please provide this analysis.

The text of Section 8 will be expanded to more clearly discuss the relative magnitude of the potential risk in each area for each endpoint.

**Response to Additional Comments
Draft Ecological Risk Assessment – Step 7
Upper Reaches of Bousch Creek
Naval Station Norfolk, Norfolk, Virginia
Dated September 2005**

This document responds to additional comments from the U.S. Environmental Protection Agency (letter dated 5 July 2006) on the draft Step 7 ecological risk assessment for the upper reaches of Bousch Creek, Naval Station Norfolk, Norfolk, Virginia (September 2005) and the responses to the original set of comments provided by USEPA on 14 April 2006.

A. Comment 4

Original Comment:

19. Section 5.3 on page 5-2 states that for food chain modeling, ingestion screening values based on survival, growth and reproduction were used to evaluate risk to upper trophic level receptors. Table 5-4 provides ingestion screening values for mammals. The no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) used to evaluate risk from polychlorinated biphenyls (PCB) are primarily 0.14 mg/kg/day and 0.69 mg/kg/day, respectively, for different Arochlors. BTAG has identified information on the effect of PCBs on mink with a value that is much lower than the values listed in Table 5-4. Two multi-generational studies have developed NOAELs and LOAELs based on mink reproduction and kit survival (0.003 and 0.19 mg PCB/kg bw/day) and kit growth (0.003 and 0.051 mg PCB/kg bw/day) from work in Saginaw Bay, Michigan. The first study (0.003 and 0.19) is from Heaton et. al. 1995. Arch. Environ. Contam. Toxicol. 28:334-343; the second study (0.003 and 0.051) is from Restum et al. 1998. J. Toxicol. Environ. Health Part A, 54: 343-375. The results of these studies should be used to evaluate risk to mammals from PCBs.

Original Response:

The referenced studies were reviewed for possible inclusion in the assessment for the appropriate receptors (mink). Based upon this review, there are significant uncertainties associated with these two studies that would limit their applicability to this assessment. In both of these studies, mink were fed field-caught carp (treatment) that comprised various percentages of the total diet. However, in addition to PCBs, these fish contained a number of other contaminants, including dioxins, furans, and pesticides. The presence of these other contaminants increases the uncertainty of the resulting NOAEL/ LOAEL values developed for PCBs since the possible effects of these other contaminants were not controlled for. This is acknowledged in the Restum et al. study which stated that "although environmental contaminants other than PCBs were also present in the carp fed to the mink in this study, the extent of the toxic contribution of these contaminants is difficult to assess. There is little or no information available on the effects of many of these contaminants on mink". For this reason, the Navy disagrees that these studies should be used to evaluate potential risks to mammals from exposure to PCBs via food webs. Controlled laboratory studies with mink

and PCBs have typically yielded NOAEL and LOAEL values similar to the ones used in the assessment (differences can generally be attributed to factors such as varying assumptions in converting dietary concentrations to daily doses and the uncertainty factors that were applied).

It should be noted that modifying the current LOAEL value (0.69 mg/kg/day) to the lower values of either 0.19 mg/kg/day (a factor of about 3 lower) or 0.051 mg/kg/day (a factor of about 13.5 lower) would not result in any of the Step 7 LOAEL-based HQs exceeding one (see Tables 6-11 and 6-12).

Additional Comment:

The BTAG does not concur with the response to comment 4. The BTAG acknowledges the presence of other contaminants in the carp fed to mink in the MSU studies (Tillitt, D.E., R.W. Gale, J.C. Meadows, J.L. Zajicek, P.H. Petermand, S.N. Heaton, P.D. Jones, S.J. Bursian, T.J. Kubiak, J.P. Giesy, and R.J. Aulerich. 1996. *Environ. Sci. Technol.* 30:283-291). Dioxin-like PCB congeners were 99.85% of the congener mass, but only 7.28% of the total PCBs in the lowest carp diet that caused reproductive impairment. PCBs contributed nearly 80% of the dioxin-like activity based on TEF values. TEFs reflect toxicity to multiple endpoints with population-level implications. No efforts were made to quantify the potential effects of the non-dioxin-like congeners (nearly 93% of the total PCBs), several of which are known to produce estrogenic effects capable of influencing offspring reproductive potential. In addition, co-contaminants present in the carp diet are ubiquitous and would be found in mink prey at sites throughout the country. Weathered and differentially-metabolized PCBs present in the carp are comparable to field exposures compared to commercial mixtures of PCBs added to mink feed in traditional laboratory studies. Given the pros and cons of each approach to deriving TRVs, BTAG advocates the use of TRVs derived from the MSU carp feeding studies for assessing the risk to mink at Region 3 sites.

Response:

As noted in the original response, modifying the current LOAEL value (0.69 mg/kg/day) to the lower values of either 0.19 mg/kg/day (a factor of about 3 lower) or 0.051 mg/kg/day (a factor of about 13.5 lower) would not result in any of the Step 7 LOAEL-based HQs exceeding one (see Tables 6-11 and 6-12). The Navy does not propose changing the values used in the ERA but will consider these additional toxicological data, as well as other appropriate data, when developing a remedial strategy as part of Step 8. Therefore, the Navy proposes that no additional wording or changes to the BERA is necessary relative to this comment.

B. Comment 17

Original Comment:

17. Section 8.1, Conclusions, states, "The Bousch Creek system...currently provides limited habitat values for most ecological receptors." The issue that the risk assessment must ultimately evaluate is not whether habitat values are limited, but rather what is the ecological risk associated with the contaminants that are present. Reduced habitat value

can be directly related to the impact of the contaminants, and the recovery of the system may be contingent on the mitigation of the identified risk.

Original Response:

As discussed in the ERA, the Bousch Creek system has been significantly impacted due to channelization and other physical modifications. Thus, large portions of the creek system, as currently configured, provide limited habitat values irrespective of chemical concentrations. As this will limit exposures, it is relevant both to the determination of overall risk and to decision-making as part of risk management. While there may be viable habitat in certain areas of the upper portion of Bousch Creek, the spatial extent is limited, especially relative to ecological populations.

Additional Comment:

Regarding the response to comment 17, while habitat may be limited in Bousch Creek due to "...channelization and other physical considerations...", for the purposes of assessing risk attributable to the site to the ecological receptors present, these factors are irrelevant. The lack of suitable habitat may limit the number and types of receptors for which risk must be assessed.

Response:

The Navy concurs with the comment. The ecological risk assessment is a framework that evaluates the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to one or more stressors (USEPA 1992). The Navy reiterates that the Bousch Creek system has been altered from historical conditions such that its main purpose, currently, is as a drainage conveyance. Thus, with a few exceptions (e.g., the emergent wetland area just west of CAL, where wetland enhancement activities unrelated to the IR program are planned), the Bousch Creek system provides limited habitat. Habitat factors are relevant considerations when developing a remedial strategy in the feasibility study but are not pertinent to the objective of defining the potential risk present in the upper reaches of Bousch Creek to the endpoints selected. Accordingly, the Navy will delete the habitat language from Section 8.1. Consideration as to the habitat value of the upper reaches will be considered as appropriate in Step 8 and subsequent to the feasibility study.

C. New Comment

The responses provided promote re-examination of the conclusions presented in the BERA. Specifically, on page 6-10, Section 6.7.2, Upper-Middle Reaches, concludes that risk to benthic invertebrates in this portion of the creek is "...possible, most likely due to PAH exposures from sediments. Based upon the results of sediment chemistry and toxicity testing, the greatest potential impacts appear to be limited to the area along I-564. Based upon concentration gradients and a general lack of correlation with CAL-related constituents, these impacts do not appear to be attributable to the CAL." Based on the data presented in the report and the responses to the BTAG comments, it is uncertain if this conclusion is adequately supported or correct. It can be debated that these data, along with the description of materials deposited at CAL and CASY can be used to support the conclusion that CAL and CASY are a source for PAHs.

Response:

As discussed in the response to Comment 1 from the first set of USEPA comments, the ERA focused on the upper and upper-middle reaches of Bousch Creek, encompassing the areas upgradient of the 3,900-foot culvert to Willoughby Bay. This spatial focus (relative to CAL) is justified by the analysis in Section 6.7.3.2 (spatial trends), which showed that for metals, pesticides, and PCBs (which are known to be associated with the CAL and/or the CASY), the highest concentrations tend to be associated with historical samples from CASY and the northern portion of CAL (Zones 1, 2, 4, and 5), while the lowest concentrations tend to be associated with the upper-middle reaches of the Bousch Creek system nearest the culvert (Zones 7 and 8). For PAHs, which have numerous potential sources (including non-IR-related sources), the highest concentrations were typically associated with the CD Landfill (pre-remedial samples) and the area near I-564 and the runway (Zone 8). The higher PAH concentrations in Zone 8 were essentially driven by a single 2004 sample near the upgradient end of the culvert. The spatial and temporal patterns of PAH concentrations in sediment clearly show that these higher Zone 8 PAH concentrations in 2004 are not related to CAL, CASY, or the CD Landfill. There are, however, possible petroleum-related source areas in the Zone 8 area (e.g., runway and highway), as well as the lower reaches of the system. An evaluation of the lower reaches of Bousch Creek (encompassing the culvert area) will be conducted as a separate, future assessment to address potential releases from IR sites (other than CAL/CASY) that may have occurred in this portion of the Bousch Creek system. Future investigation of the lower reaches will follow the CERCLA process and Navy policies. Specifically, all transport pathways of PAHs from an identified IR source in the lower reaches will be properly investigated, including the potential for tidal transport into upstream locations. Therefore, the Navy proposes that no additional wording or changes to the BERA is necessary relative to this comment.